

Clinical characteristics of patients with atrial fibrillation or atrial flutter hospitalized during the COVID-19 pandemic: a population analysis of nearly 5 million people

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Introduction The number of hospitalizations of patients with atrial fibrillation (AF) has been steadily increasing in recent years,¹ and this population constituted a significant percentage of patients included in registries.^{2,3} Furthermore, AF is associated with a higher risk of at least one hospitalization per year and was linked to an increased length of hospital stay regardless of the initial diagnosis.² The pandemic of COVID-19, which is caused by the novel SARS-CoV-2, has contributed to significant changes in the organization of healthcare systems worldwide. Due to the increasing number of COVID-19-related hospitalizations, most elective hospital admissions are deferred. This may have affected the profile of patients with AF referred for in-hospital treatment.

The aim of the study was to present changes in the clinical characteristics of patients with the diagnosis of AF or atrial flutter (AFL) who were hospitalized during the national lockdown imposed in March 2020. To the best of our knowledge, this is the first report from Poland on patients referred to hospitals with the diagnosis of AF or AFL during the COVID-19 pandemic.

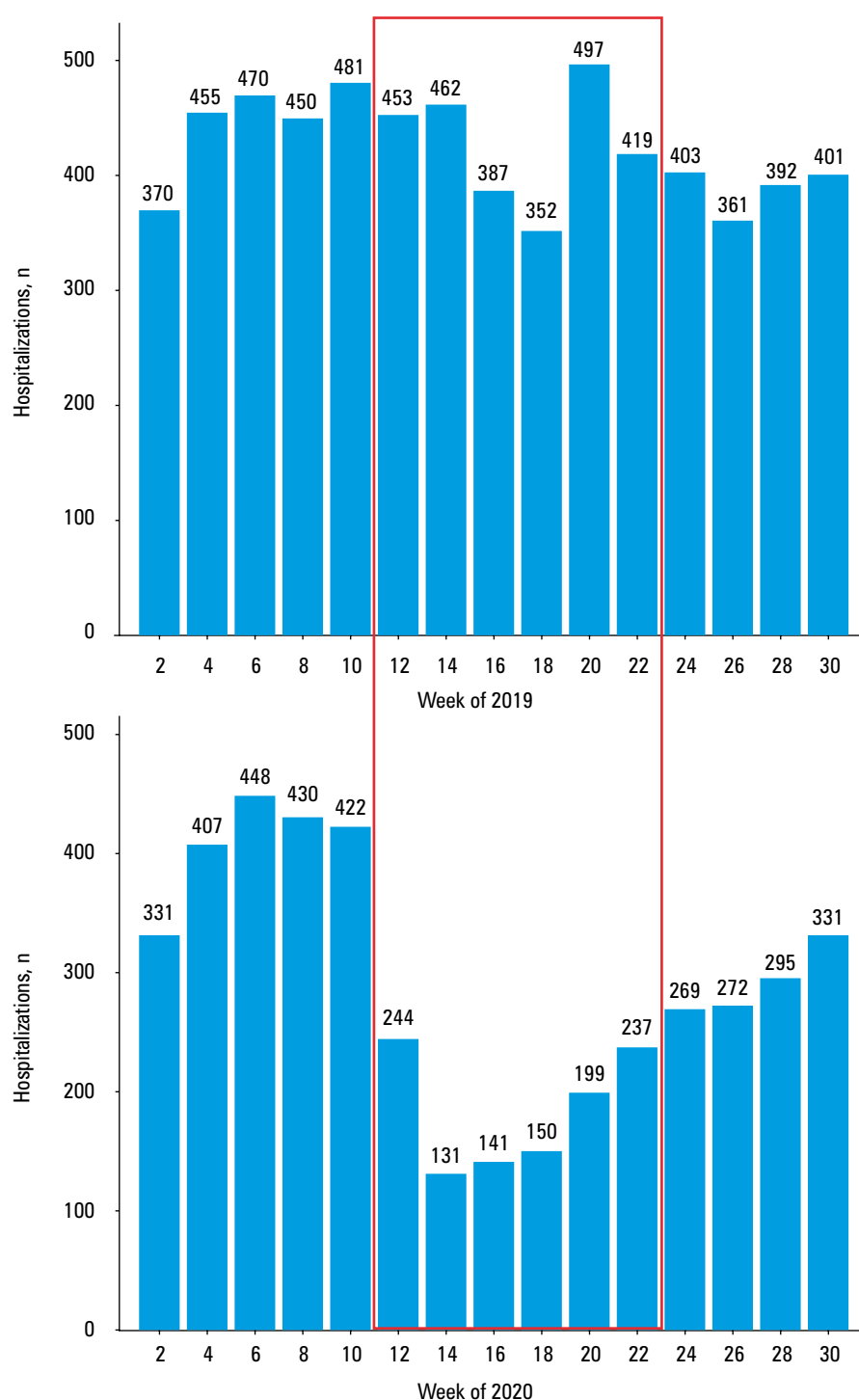
Patients and methods This retrospective analysis was based on data from the Polish National Health Fund (Narodowy Fundusz Zdrowia [NFZ]) and administrative and epidemiological data which had been collected as part of the Silesian Cardiovascular Database (SILCARD)

since 2006. The SILCARD registry was approved by the local ethics committee. The confidentiality clause was signed by individuals who were involved in data preparation. Detailed information on the SILCARD has been reported previously.⁴ The database contains the records from all hospitals (n = 310) located in the Silesian Province, which is the most urbanized region in Poland with the population of 4.57 million (approximately 12% of the total population of the country) and a well-developed hospital network with 2 tertiary cardiology centers, 3 cardiac surgery centers, and 20 catheterization laboratories. The NFZ is the only public insurance institution in Poland, which provided all data to the database. All consecutive patients hospitalized in cardiology, cardiac surgery, vascular surgery, and diabetology departments due to any reason, or admitted to the internal medicine or intensive care department with the principal diagnosis of cardiovascular disease (CVD) were included in the SILCARD registry. The only exclusion criteria were residency outside of the Silesian Province and age younger than 18 years at admission. The initial hospitalization was defined as the admission with the principal diagnosis of CVD, including a potential transfer to another department or hospital. This hospitalization was used as the baseline for the follow-up. Hospitalizations with an interval shorter than a single day were treated as a single hospital stay.

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FIGURE 1 The number of hospitalizations of patients with atrial fibrillation or atrial flutter during the compared time periods in 2019 (A) and 2020 (B) at 2-week intervals (the study periods have been highlighted in the frame)



The next admission to the hospital with a minimum of a 1-day intermission did not exclude the patient from analysis. According to the general rules, Polish hospitals are obliged to report to the NFZ the exact dates of hospitalization and the principal diagnosis with up to 2 comorbidities defined by the *International Classification of Diseases, Tenth Revision (ICD-10)* for each patient with a list of performed medical procedures based on the *International Classification of Diseases, Ninth Revision*. According to the ICD-10, CVD is defined as R52, or J96, or any “I” code. It was possible to match information of individual patients through the hospital registry number and the national identification number (PESEL). All data were anonymized.

To achieve the aim of the study, patients with the principal diagnosis of AF or AFL (ICD-10 code I48) who underwent hospitalization between weeks 12 and 22 of 2019 and weeks 12 and 22 of 2020 were included for further analysis from the SILCARD registry. Based on the information available from the NFZ, especially the number of hospitalizations and patient baseline characteristics (sex, age, comorbidities), the data from pre-specified time periods were analyzed. The above data were collected according to the ICD-10 codes reported to the NFZ from the beginning of the registry to the current hospitalization, including in-hospital or outpatient services. The assignment of hospitalization to the 2-week periods presented in [FIGURE 1](#) was based on admission data.

Statistical analysis Statistical analysis was performed using STATISTICA PL version 13.3 (TIBCO, Palo Alto, California, United States). Data distribution was verified for normality using the Shapiro–Wilk test. Continuous variables were summarized using medians with interquartile ranges (IQRs) for nonnormal distribution and were compared using the Mann–Whitney test. Categorical variables were presented as number and percentage and the χ^2 test was calculated to examine the differences between the groups. A 2-tailed *P* value of less than 0.05 was used to indicate statistical significance.

Results and discussion The number of hospitalizations in cardiology centers worldwide drastically declined during the first wave of the COVID-19 pandemic. Our analysis showed differences in the management of patients in the COVID-19 and pre-COVID-19 periods in Poland. The number of hospitalized patients with AF or AFL during the national lockdown in the region inhabited by 3.8 million adults decreased by 59.72% compared with the same period in 2019 (876 vs 2175, respectively). After the lockdown, the number of hospitalizations gradually increased. However, it did not return to the prepandemic level (FIGURE 1). The clinical characteristics of patients hospitalized during the analyzed periods are given in Supplementary material, Table S1. Patients admitted to the hospital during the pandemic were significantly older than in the corresponding period in 2019 (median age, 72 vs 71 years; *P* = 0.002) and presented with more comorbidities.

Patients who underwent hospitalization in 2020 more often presented with hypertension (63.9% vs 58.4%; *P* = 0.005) and coronary artery disease (47.5% vs 39.8%; *P* = 0.001). Prior myocardial infarction (11.8% vs 9.2%; *P* = 0.03) and stroke (8.3% vs 6.3%; *P* = 0.045) were more prevalent in patients admitted during the lockdown. Interestingly, patients were more likely to be previously diagnosed with AF or AFL (62.4% vs 56.6%; *P* = 0.002) and had already undergone the ablation procedure (7.2% vs 4.9%; *P* = 0.01).

It would seem that during the COVID-19 pandemic, the number of patients diagnosed and hospitalized, especially as urgent admissions with the diagnosis of AF, should increase. Although COVID-19 affects primarily the respiratory tract, it could also affect multiple organs, particularly the cardiovascular system and the most common complications include arrhythmias, especially AF.^{5,6} Based on the Heart Rhythm Society worldwide survey from the beginning of the pandemic, the prevalence of AF in patients with COVID-19 was 21%. In turn, AFL was reported in 5.4% cases.⁷ These numbers increased in patients with CVD (36%–42% of patients who did not survive COVID-19).⁸ Considering the high incidence of AF in patients with severe pneumonia, fever, acute respiratory distress syndrome, or sepsis, the expected number of patients hospitalized with the diagnosis

of AF should be much higher during the pandemic period. However, available data showed an opposite trend. According to a Danish registry, a 47% decrease in the total number of registered new-onset AF during the national lockdown was found.⁹ Our analysis demonstrated an even greater decrease in the number of hospitalizations of patients with AF or AFL. Furthermore, isolation resulting from the lockdown promoted decreased physical activity and increased alcohol consumption, both of which are risk factors for AF.¹⁰ Thus, we presumed that many cases were undetected and untreated and, as a result, were not reported to the NFZ. The results may have been influenced by many factors. The first and the most important was the limited access to healthcare providers and the need to adapt the healthcare system to the new pandemic reality. Patients were encouraged to stay at home and avoid social interactions, including routine visits to general practitioners or outpatient clinics. Many visits were conducted remotely (telemedicine) without physical examination and electrocardiogram recording, which prevented the detection of asymptomatic or mildly symptomatic AF or AFL. Therefore, the number of referrals for direct current cardioversion or ablation also decreased. This may have been the reason why elderly patients with more comorbidities and poor tolerance of arrhythmia were mostly hospitalized. In these patients, the risk of complications associated with the lack of treatment of the underlying CVD outweighed the risk of the SARS-CoV-2 infection. This approach was reflected in the recommendations of cardiology societies,¹¹ which advised limiting the procedures to the most acute patients. Another aspect that affected the decreased number of referrals to hospitals could be related to the limited access to transesophageal echocardiography in outpatient settings before elective procedures in clinically stable patients due to an increased risk of airborne transmission of the coronavirus to the medical personnel performing the examination.¹² In addition, a limited number of implantable device check-ups might have contributed to a decline in the detection of AF or AFL. Patients' fear of being infected with SARS-CoV-2 in hospital settings was probably another essential factor affecting hospitalization rates.

The tendency to avoid hospitalization that was typical of the first peak of the COVID-19 pandemic may have resulted in collateral damage in the form of increased morbidity and mortality that occurred in home settings. However, it is currently difficult to estimate the above phenomenon and further analyses are warranted.

Limitations of the study The above analysis has some limitations. First, the source registry was based on the electronic database of a single insurance institution and it was limited to core variables, such as demographic data, comorbidities, and in-hospital events. Moreover, the classification

often does not specify the subcodes of individual diseases, which makes it difficult to exactly specify all diagnoses. Similarly, it is not mandatory to report information on the clinical characteristics, including all comorbidities. Therefore, the available data may be incomplete in this respect.

Conclusions The lockdown due to the COVID-19 pandemic caused a decrease in the number of hospital admissions of patients with AF or AFL. Over this period, elderly patients with a greater number of comorbidities were treated in hospital settings.

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/paim.

ARTICLE INFORMATION

AVAILABILITY OF DATA AND MATERIAL Data from the Polish National Health Fund (Narodowy Fundusz Zdrowia, NFZ) and administrative and epidemiological data were collected as part of the Silesian Cardiovascular Database (SILCARD) (ClinicalTrials.gov identifier, NCT02743533; <https://clinicaltrials.gov/ct2/show/NCT02743533>).

CONFLICT OF INTEREST None declared.

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